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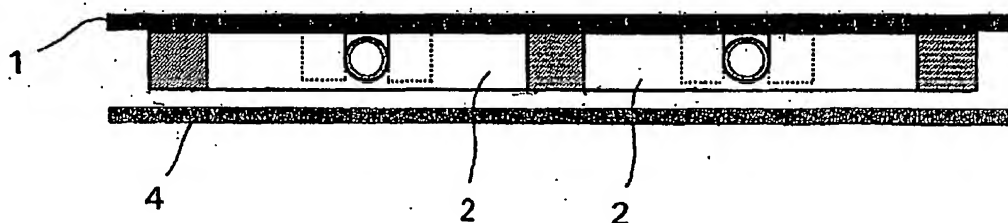
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(54) Fluidisation apparatus

(57) The object of the invention is a fluidisation apparatus to be placed at the bottom of a container to improve the flowing of a powder-like substance from the same. With the apparatus a gaseous medium is lead through a part forming a fluidisation plate, which is a flat plate that lets a gaseous medium through, into the powder-like substance in surface contact therewith. The

plate is connected to a feeding set of compartments for the gaseous medium, opposite of which is a lock plate, and each of the compartments (2) is equipped with a strangulated feed for the gaseous medium. The feed to the compartments (2) is arranged through canals (3) running intermediate the fluidisation plate and the lock plate, which are individually strangulated for each compartment.

Fig. 2



Description

[0001] The scope of the invention is an apparatus placed at the bottom of a relatively large container or silo, with the help of which the flowing of a powder-like substance from the container may be assisted. The effect improving the flowing, i.e. the fluidisation effect, is created by leading, with the apparatus, a gaseous medium preferably air, into the powder-like substance that it is in surface contact with.

[0002] An apparatus of this kind is described in patent application publication WO-A1-89/11378. In the solution according to the publication several longish channel elements have been placed at the bottom of the container containing a powder-like substance, the bottom of the container inclining toward an outlet went. The channel elements are directed towards the outlet went of the container and their walls are made of a metal sheet construction that lets a gaseous medium through, but does not let powder-like substances, such as cement, through. Each channel element is divided longitudinally into separate chambers, of which to each an own supply of gaseous medium has been arranged. Each supply is strangled to limit the flow of the gaseous medium to the chamber that has been freed from under the powder-like substance. It is possible to arrange the strangulation with consideration to the purpose of use of the container. The channel elements are meant to be fastened by welding their edges to the metal base of the container. The supply of the medium to the chambers of the channels is arranged through the base of the container.

[0003] The apparatus as such works well and solves the problems of feeding the powder-like substance, such as vaulting, because of which the feeding can be made to happen as an essentially even flow. A problem with the apparatus though, is the difficulty of installing it. It is also only suitable for containers with an inner base of metal. The installation also requires that the base has to be perforated at several points to create a supply of the gaseous medium to the different chambers.

[0004] These problems do not occur in an apparatus according to the present invention. The apparatus is implemented as a plate-like unit ready for installation, as specified more in detail in the enclosed claims.

[0005] The invention is explained with the help of the accompanying drawing, where

Fig.1 shows an apparatus according to the present invention viewed from beneath before the finishing phase, and

Fig. 2 shows a cross section of an apparatus according to the present invention at the finishing phase.

[0006] In Fig. 1 an example of an apparatus according to the invention is shown after the casting and vulcanisation phase of its manufacturing process from beneath

or i.e. its moulding side. The body of the apparatus is formed by a grate-like, flat surfaced set of compartments, consisting of separate compartments 2. The set of compartments is manufactured in a corresponding mould by moulding from an elastomer that can be vulcanised in the mould to an appropriate hardness. One of the flat surfaces of the set of compartments is properly covered during the moulding and vulcanisation phase by a fabric or a carpet 1, as shown in Fig. 2. By this function, carpet 1 is attached to the corresponding flat surface of the set of compartments. Said carpet is advantageously the porous surface of the apparatus, that comes in touch with the fine substance to be fluidised. The carpet lets the gaseous medium through, but does not let the fine solid substance through, that the apparatus is used to fluidise.

[0007] In connection with the manufacturing of the set of compartments a system of channels is incorporated in its structure, with the help of which, in the completed apparatus, the gaseous medium is lead to individual compartments 2. The system of channels is formed appropriately by tubes 3 that are placed in the casting mould before the casting phase, to run in one direction of the apparatus through the successive compartments 2. The tubes 3 forming the system of channels, consist advantageously of a plastic material, that stands the temperature used in the manufacturing process of the set of compartments. The tubes are equipped, at each compartment, with an opening flow went, that is dimensioned according to the purpose of use for the apparatus to achieve an appropriately strangled flow of the gaseous medium into each compartment 2. In dimensioning of the outlet wents, it is to be observed, that the feeding capacity of the tube 3 should be enough to allow a sufficient flow of gaseous medium to all the compartments in the corresponding row also in the cases, where some of the compartments are no longer covered by the fine substance.

[0008] The apparatus is finished after the moulding and vulcanising, by covering the still free surfaced side of the set of compartments with a lock plate or carpet 4. As a carpet 4 an elastomer material is used, that is attachable to the dividing walls by, for example, gluing. Also other methods of attaching, known for elastomer materials, can of course be used, such as local heating of surfaces to be combined, for example with radiant heating. Correspondingly the carpet 1 forming the porous surface of the apparatus may be attached to the corresponding surface of the set of compartments by using these alternative methods as a separate function from the moulding and vulcanisation phase.

[0009] In connection with the casting of the apparatus, a gathering part 5 can be moulded at one of the gable edges that bind together the feeding ends of the feeding tubes 3 to a unit. The feeding tubes are thus easily connectable to the manifold of the feed of the gaseous medium.

[0010] In this way manufactured, the apparatus ac-

cording to the present invention forms a plate-like or carpet-like construction, that includes all the necessary elements for the functioning of the apparatus, and that is possible to install as such for example at the bottom of a storage silo. The attachment is advantageously carried out by gluing the lock plates 4 of the apparatus to the bottom of the silo.

[0011] By choosing the material for each of the parts of the apparatus, the construction can be made flexible, in which case it adapts without problems to the possible irregularities of the place of instalment. The independent structure makes it possible to attach the apparatus to surfaces of different materials, such as concrete surfaces. Even large surfaces can easily be covered, by installing several units side by side, and/or one after another.

[0012] By choice of material for the parts, the flexibility of the apparatus may be made so good that the apparatus can be rolled together for storage and transportation, and accordingly be rolled out directly at its place of instalment.

by vulcanisation congealing material, and that the fluidisation plate is attached to the set of compartments in connection with the vulcanisation.

- 5 5. An apparatus according to claim 3 or 4, **characterized in, that** the set of compartments is formed as a casting body and that the feeding channels (3) of the gaseous medium are attached to the set of compartments in connection with the moulding of the same.
- 10 6. An apparatus according to claim 5, **characterized in, that** a feeding unit (5) for the gaseous medium is formed as a part of the apparatus for the feeding channels (3) for the gaseous medium.
- 15 7. An apparatus according to claim 3, **characterized in, that** it can be installed from a roll at the place of installation by gluing.

Claims

- 25 1. Apparatus to be installed at the bottom of a container to make a powder-like substance flow out of the container, when a gaseous substance is lead by the apparatus into the powder-like substance it is in surface contact with, through a part forming a fluidisa-
30 tion surface, that is a flat plate that lets the gaseous medium through, that on the opposite side is connected to a feeding set of compartments for the gaseous medium, where each of the compartments (2) is equipped with a strangulated feed for the gaseous medium, **characterized in, that** the set of compartments is closed with a lock plate (4) at the opposite side from the fluidisation plate (1) and that the feed of the medium to the compartments (2) is arranged through channels (3) that run intermediate
40 the fluidisation plate and the lock plate, equipped with strangulated feeding wents for each compartment.
- 45 2. An apparatus according to claim 1, **characterized in, that** the compartments (2) are arranged in rows in direction of the flowing, and that the compartments in one row are combined to the same feeding channel (3) for the gaseous medium.
- 50 3. An apparatus according to claim 1 or 2, **characterized in, that** the fluidisation plate (1) is formed from a flexible and porous carpet and that the other parts of the apparatus are made of a flexible elastomer material.
- 55 4. An apparatus according to claim 3, **characterized in, that** the set of compartments is manufactured of

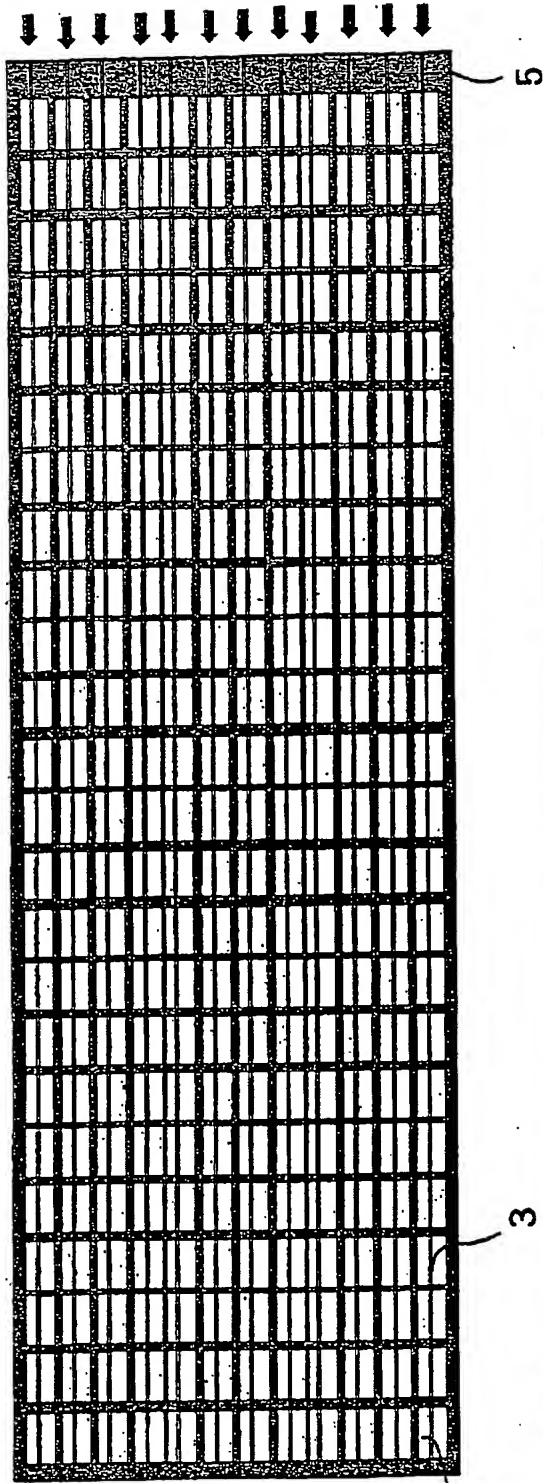


Fig. 1

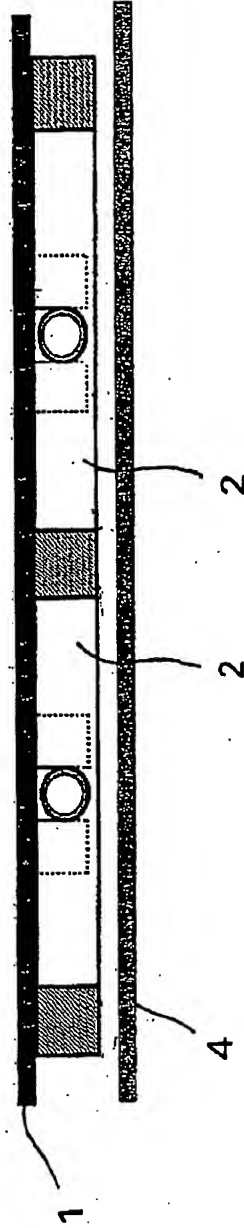


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 03 39 6055

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	CH 415 464 A (BUEHLER AG GEB) 15 June 1966 (1966-06-15) * page 1, line 54 - line 62; claim 2; figure 2 *	1,2	B65D88/72
A	US 5 547 331 A (PODD STEPHEN D ET AL) 20 August 1996 (1996-08-20) * abstract; figures *	3,6,7	
P,A	WO 03 037753 A (DICK DAVID STUART) 8 May 2003 (2003-05-08) * page 10, line 29 - page 11, line 27; figure 6 *	1	
A	GB 2 116 938 A (CYCLONAIRE CORP) 5 October 1983 (1983-10-05) * the whole document *	1	
D,A	WO 89 11378 A (PARTEK AB) 30 November 1989 (1989-11-30) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65D B65G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 30 September 2003	Examiner Zanghi, A
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 39 6055

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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30-09-2003

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CH 415464	A	15-06-1966	NONE	
US 5547331	A	20-08-1996	AU 5139293 A WO 9406648 A1	12-04-1994 31-03-1994
WO 03037753	A	08-05-2003	WO 03037753 A1	08-05-2003
GB 2116938	A	05-10-1983	AU 558894 B2 AU 1241883 A JP 58167322 A	12-02-1987 22-09-1983 03-10-1983
WO 8911378	A	30-11-1989	FI 882470 A AT 97380 T DE 68910819 D1 DE 68910819 T2 DK 171178 B1 EP 0409904 A1 WO 8911378 A1 JP 2801940 B2 JP 3504483 T NO 905072 A , B,	26-11-1989 15-12-1993 23-12-1993 17-03-1994 15-07-1996 30-01-1991 30-11-1989 21-09-1998 03-10-1991 22-11-1990